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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/669,732	09/26/2000	Tetsuro Nakasugi	04329.2439	5628

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EXAMINER	
JOHNSTON, PHILLIP A	
ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 07/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/669,732	NAKASUGI ET AL.	
	Examiner	Art Unit	
	Phillip A Johnston	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 May 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 September 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Pri rity under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Detail d Action

Examiners Response to Arguments

Claims Rejection – 35 U.S.C. 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-24 stand as rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,172,365, to Hiroi, in view of Zhao, U. S. Patent No. 6,157,087, and in further view of Hosono, U. S. Patent No. 5,093,572.

3. Applicant's arguments filed 2-28-2003 have been fully considered but they are not persuasive.

Argument 1

Applicant states, that "Hiroi, however, fails to disclose or suggest a combination of elements including at least, "an image information generating section for rearranging the secondary electron detection signals in association with the scan positions on the basis of the table, thereby generating image information of a surface of the sample," as recited in claim 1, nor does the Examiner identify a portion of Hiroi alleged to disclose or suggest this claim element. In fact, Hiroi would not disclose or suggest a combination including the above element. An object of Hiroi is to reduce the charge involved with electron beam radiation. (Hiroi, col. 44, lines 17-30). In operation, "the irradiated electron beam absorbed and consequently the yielded secondary electrons are significantly reduced as compared with the irradiation electron beam." (col. 12, lines 15-20.)

By contrast, claim 1 recites a pattern observation apparatus that requires scanning a charged particle beam over a sample and detecting secondary electrons produced from the sample by the scanning of the charged particle beam. Thus, the charge up produces a potential

distribution reflecting the structure of the sample on the surface of the sample, allowing observance of a secondary electron contrast image due to the potential distribution."

Argument 2

Applicant states, that "Without intentionally generating a charge up, a person skilled in the art could not conceive the technique of arbitrarily setting the scan order." Thus, Hiroi does not achieve the effect of preventing generation of an asymmetrical signal, which is provided by the apparatus of claim 1.

Hiroi's object of reducing the charge involved with electron beam radiation and reducing the yielded secondary electrons also teaches away from a combination of elements including "an image information generating section for rearranging the secondary electron detection signals in association with the scan positions on the basis of the table," as recited in claim 1. Such a difference in the principle for generating the secondary beam contrast image results in a structural difference between the apparatus of claim 1 and Hiroi.

Further, Applicants disagree with the Examiner's characterization of Hiroi. For example, according to the Examiner, "It is implied herein that specifying the process and object index, and setting the scan sequence in accordance with Hiroi (365), is equivalent to 'generating a table in which a scan order is associated with scan positions', as recited in claims 1 and 11."

The applicant is respectfully directed to Column 19, line 20-57 in Hiroi (365), which states; Correction of the inspection conditions forming components of these systems, setting the inspection conditions based on information from the object, and setting the corrected inspection conditions will now be described. In other words, it suffices that the relations shown in FIGS. 1 and 10 are derived beforehand. If in the section structure (such as the materials A and B) of the object 20 the dependence of the secondary electron yield ratio ή upon the acceleration voltage ($E=E_0-E_2$) between the electron source 14 and the object 20 and the potential difference ($E=E_0-E_1$) proportionate to the electric field α on the object is known, i.e., these relation tables are created, then a proper contrast value ρ (given by a difference between the secondary electron yield ratio ή from the upper layer pattern and the secondary electron yield ratio ή from the lower layer pattern) indicated by a difference in

brightness of image signal between the upper layer pattern and the lower layer pattern can be chosen so as to prevent the charge-up from occurring with respect to the upper layer pattern within a certain permissible range (i.e., so as to attain a small permissible value range of the secondary electron yield ratio ή from the upper layer pattern around unity) and so as to suppress the charge-up as far as possible for the lower layer pattern as well (i.e., so as to attain a large permissible value range [such as a range of 0.7 to 1.2] of the secondary electron yield ratio ή from the lower layer pattern around unity).

In other words, a proper acceleration voltage Ec is chosen as shown in FIG. 11 so as to make large the difference (contrast ρ) between the secondary electron yield ratio ή (illustrated by solid lines) from the upper layer pattern (material A) and the secondary electron yield ratio ή (illustrated by broken lines) from the lower layer pattern (material B). Thereafter, a potential difference ($E=E_0-E_1$) proportionate to the electric field α on the object is chosen so as to put the secondary electron yield ratio ή from the upper layer pattern (material A) into a small permissible value range around unity. If at that time the secondary electron yield ratio ή from the lower layer pattern (material B) does not come in a large permissible value range around unity, then proper inspection conditions can be chosen by finely adjusting the acceleration voltage Ec.

The applicant is also respectfully directed to Column 15, line 3-35 in Hiroi (365), which states; Furthermore, the charge-up phenomenon can be changed and the detected image signal can be made proper also by controlling the beam current on the

object, beam diameter, image detection rate (which is the clock frequency for reading image signals and which changes the beam current density), or the image dimension (which is changed by changing the scan rate of the electron beam and consequently the beam current density).

As heretofore described, according to the material and the section structure of the pattern of the object (such as the shape of the pattern [including the pattern width and pattern density] and thickness of the pattern and the relation with respect to the constituent material [material] of the lower layer), two parameters, for example, (the acceleration voltage E of the electron beam used to irradiate the object and the electric field α on the object) are controlled according to a predetermined relation. Thereby, the secondary electron yield ratio ή especially from the pattern located in the upper layer is set in a range (approximately unity) permissible with respect to unity. Thereby, the charge-up occurring in the pattern located in the upper layer is reduced to become less than a predetermined value so as to hardly occur. By putting the secondary electron yield ratio ή from the material located in the lower layer into a predetermined range (such as the range of 0.7 to 1.2), the charge-up is reduced as far as possible also for the material located in the lower layer. In addition, by making the difference in secondary electron yield ratio ή between the pattern located in the upper layer and the pattern spacing which is not located in the upper layer large as far as possible, the contrast ρ can be made proper.

The examiner has interpreted from the Hiroi (365) references above, that charge-up control is provided in accordance with Hiroi (365) by first setting up a table of

secondary electron emission efficiencies of various materials, as a function of acceleration voltage Ec. Then optimizing image contrast during scanning by selecting the acceleration voltage for the material to be imaged, that maximizes the difference of the sample materials secondary electron emission efficiency relative to, a surrounding (different) materials secondary electron emission efficiency.

The applicant is further respectfully directed to Column 14, line 33-46 in Hiroi (365), which states; Furthermore, since the charge-up ease phenomenon (diffusion phenomenon of electric charge charged up) occurs in the pattern especially located in the upper layer, there occurs a difference in the image signal detected by the sensor 11 according to whether the scan direction of the electron beam is the X direction or Y direction as shown in FIGS. 6B and 6C. Therefore, it is necessary to set especially the acceleration voltage E of the electron beam used to irradiate the object and the electric field α on the object at proper values so as to reduce as far as possible the difference between an image signal detected by the sensor 11 when the scan direction of the electron beam with respect to the object 20 is the X direction and that when the scan direction of the electron beam is the Y direction.

The examiner has interpreted from the Hiroi (365) reference above, that by setting the acceleration voltage to a value that provides the same image signal whether scanning in the x or y direction, allows scanning to be performed without regard for scan directional effects; i.e., preventing asymmetric signals due to scan direction, which is also equivalent to scanning in an arbitrary scan order.

Argument 3

The Applicant states; "Hiroi fails to disclose or suggest, however, a combination of elements including at least, "a first beam radiation section for performing a first charged particle beam radiation on a sample in which a pattern is formed on a substrate and a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern, and charging a surface of the sample," as recited in claim 6. Also, Applicants submit that "a pattern formed on a substrate" cannot be observed without intentionally generating a charge up. As discussed above with respect to claim 1, Hiroi teaches away from a charge up because an object of Hiroi is to reduce the charge involved with electron beam radiation. (Hiroi, col. 44, lines 17-30). In operation "the irradiated electron beam absorbed and consequently the yielded secondary electrons are significantly reduced as compared with the irradiation electron beam." (Ibid., col. 12, lines 15-20.) It is therefore Applicants belief that the apparatus of Hiroi, which reduces the charge involved with electron beam radiation, could not "observe the pattern by detecting secondary electrons from the surface of the sample," as recited in claim 6."

The applicant is respectfully directed to page 31, line 22-27, and page 32, line 1-18 of the applicants specification which states; A preferable method in the case where the acceleration voltage is varied will now be described with reference to FIG. 13.

Where the sample surface is to be positively charged, the acceleration voltage is set at vl in the first beam radiation in the figure in order to charge the sample more on the positive side. In the second beam radiation, an acceleration voltage v2 or v2', at which the emission efficiency of secondary electrons is made less than in the first beam radiation, is selected. Thus, the increase in positive charge in. the second beam radiation becomes gentler than in the first beam radiation, and high-precision mark detection can be made. On the other hand, where the sample surface is to be negatively charged, the acceleration voltage is set at v4 or v4' in the first beam radiation in the figure in order to charge the sample more on the negative side. In the second beam radiation, an acceleration voltage v3 or v3', at which the emission efficiency of secondary electrons is made greater than in the first beam radiation, is

selected. Thus, the increase in negative charge in the second beam radiation becomes gentler than in the first beam radiation, and high precision mark detection can be made.

The examiner has interpreted from this statement from the applicants specification above and the Hiroi (365) references, that both the applicant and the cited references are describing the same technique of charge-up control during scanning, as that recited in Claims 1, 6, 11 and 16.

Conclusion

4. The Amendment filed on 5-12-2003 under 37 CFR 1.131 has been considered but is ineffective to overcome the cited references.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phillip A Johnston whose telephone number is 305 7022. The examiner can normally be reached on 7:30 to 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on 703 308-4116. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872 9318 for regular communications and 703 872 9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

PJ
July 14, 2003

JOHN R. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800